



Nova Scotia Research
Foundation Corporation

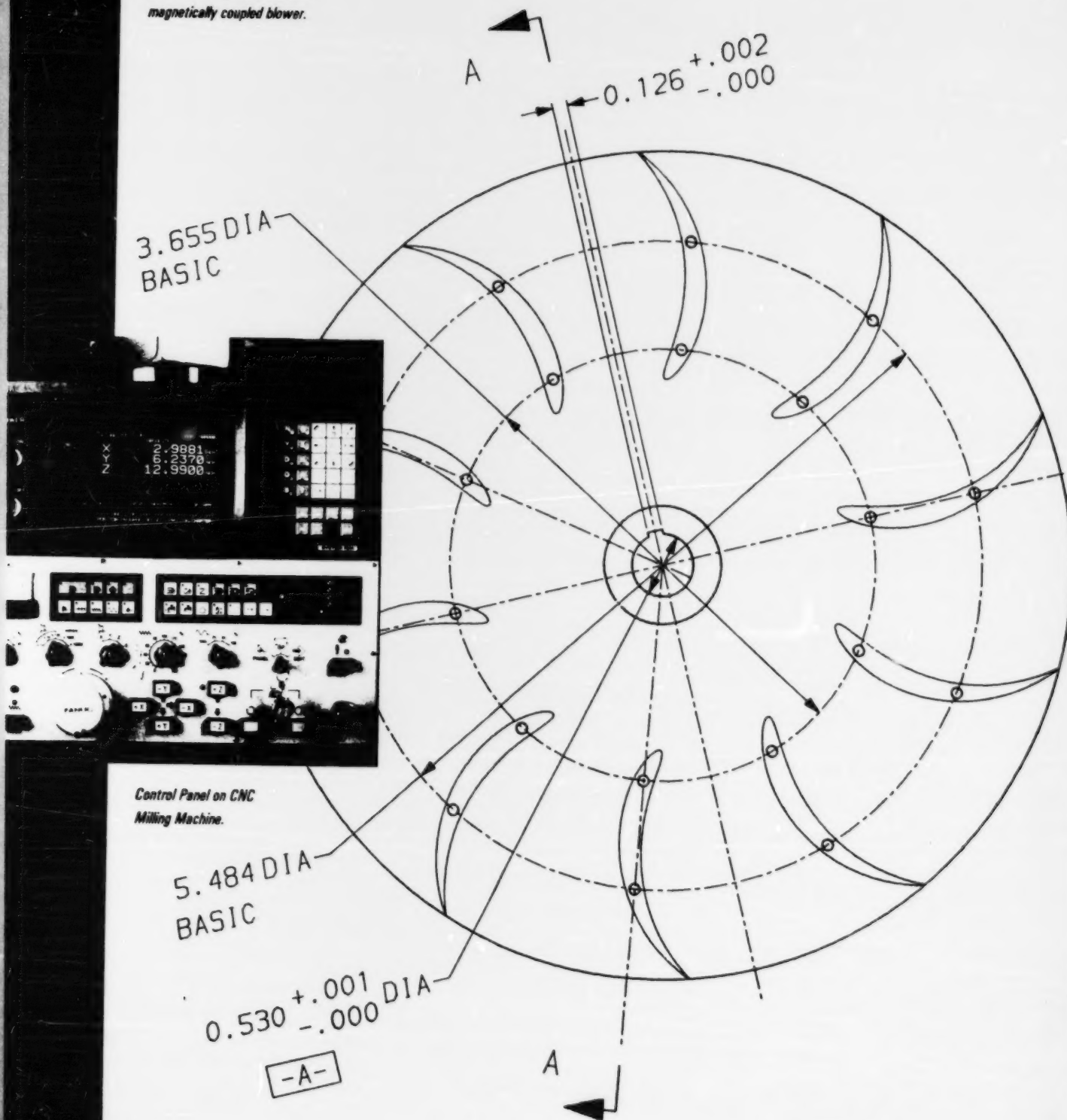


Annual Report 1986/87



TECHNOLOGY IN ACTION

Cover Photo: Machinist setting
CNC Machining Centre to
produce an impeller part for a
magnetically coupled blower.



Control Panel on CNC
Milling Machine.

Inside Front Cover:
Schematic of impeller for
magnetically coupled
blower.

CORPORATE FILE

Nova Scotia Research was established in 1946 by the Province of Nova Scotia to use science and technology to assist in the economic development of Nova Scotia.

Three operating divisions — Applied Science, Industry Services and Product Development — carry out technical assignments for 600 companies and government departments each year.

Applied Science

Technical services and applied R&D for industry and government.

Analytical and Environmental Chemistry

- Lube oil and fuels analysis
- Characterization of metals and organic mixtures
- PCB's
- Asbestos
- Indoor air quality monitoring

Biology

- Mycorrhizal fungi R&D to improve growth of coniferous trees and agricultural crops
- Nitrogen fixation in agricultural crops
- Liquid and semi-solid bacterial and fungal fermentations
- Microbiological analysis
- Quality and sanitation surveys of food-handling operations

Industry Services

Technical assistance to small and medium-sized manufacturers to improve productivity and technological capabilities.

Field Service

- Technical information/literature searches
- In-plant problem solving
- National Research Council's Industrial Research Assistance Program
- Technology transfer/acquisition
- Technology patent searches

Project Services

- Technical/market analysis
- Fisheries engineering

Product Development

Engineering, manufacturing and marketing for:

- New product and development
- Mechanical and electronic engineering and design assistance
- CAD/CAM familiarization
- Accident reconstruction

Export sales

Export sales to the worldwide ocean industry marketplace. Agents and distributors throughout North America and Europe and in Asia and Australia for these NSRFC products:

- Marine Electrical Slip Rings
- Fluid Rotary Unions
- Diving Life-Support Equipment

The Corporation pursues two main goals — assistance to industry in the solution of today's technical problems and product/process innovation in anticipation of tomorrow's opportunities. While the Corporation serves all sectors of Nova Scotia's industrial economy, it emphasizes technological support for secondary manufacturing industry and takes a special interest in developing Nova Scotia's ocean industry potential.

Coal Technology

- Process development and economic studies relating to the utilization of Nova Scotia's coal resources
- Coal liquefaction R&D
- Spray testing and rheology studies on coal-liquid fuels
- Mineral utilization and industrial waste management

Geophysics

- Marine surveys for geotechnical and geological studies
- Land geophysical surveys
- Borehole geophysical logging
- Data compilation, processing and interpretation

- Bioresource machine applications engineering
- Mathematics and computer applications
- Glassblowing

Materials

- Mechanical and metallurgical testing
- Welding procedure qualification
- Failure analysis
- Ceramics R&D
- Corrosion R&D

Library

- Computer database searches
- Technical searches

- Geophysical Marine Equipment
- Underwater Instrumentation

The Applied Microelectronics Institute:

- provides microelectronics assistance
- a joint venture of NSRFC, Dalhousie University and the Technical University of Nova Scotia

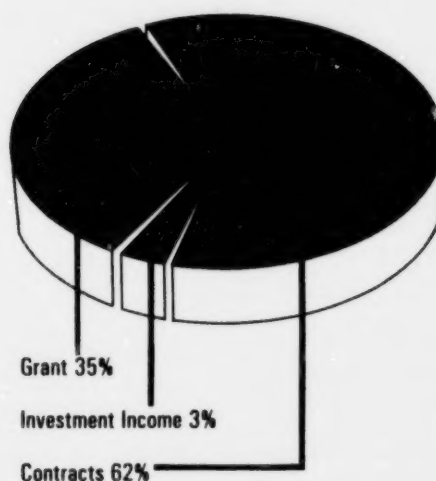
Nova Magnetics Limited:

- designs, manufactures and markets magnetically-coupled zero-leakage blowers and pumps for the nuclear and chemical industry
- a wholly-owned subsidiary of NSRFC

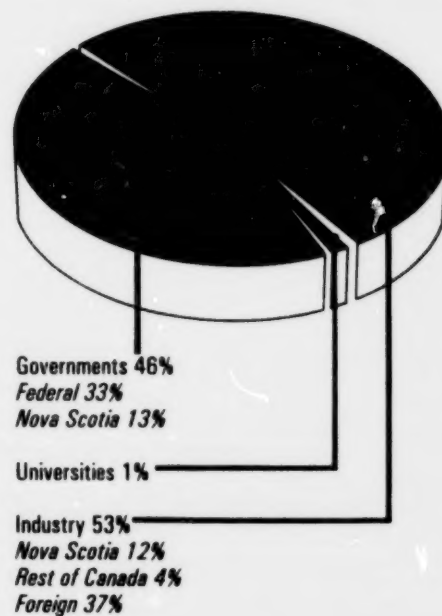
FINANCIAL SUMMARY

	1987	1986
Revenue		
Scientific & Engineering Contracts	\$4,213,852	\$4,054,797
Grant from Province of Nova Scotia	2,336,000	2,233,100
Investment Income	190,649	214,998
Expenses		
Science and Engineering	5,600,539	5,590,367
Administration & Occupancy	1,162,659	1,123,224
Net Income (Loss)	(22,697)	(210,696)

Source of Revenue 1986/87

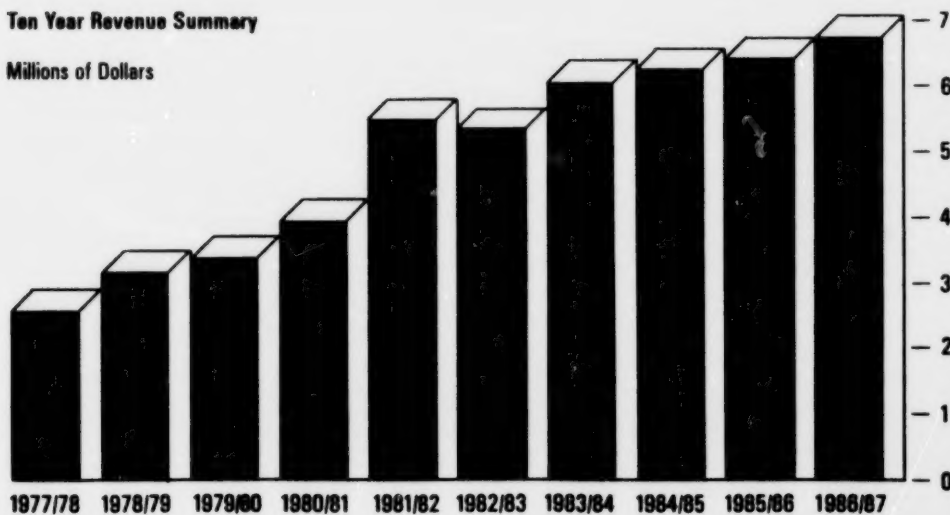


Source of Contracts 1986/87



Ten Year Revenue Summary

Millions of Dollars



PRESIDENT'S REPORT

With this annual report the Nova Scotia Research Foundation Corporation completes 40 years of technological assistance to Nova Scotia industry. The accomplishments have been impressive. From a modest beginning the Corporation has grown to a staff of 120 scientists, engineers, technicians and support personnel who last year helped 630 Nova Scotia companies solve technical problems and develop new products and processes.

Since 1946 the Corporation has been involved in technology developments and their application in all sectors of Nova Scotia's industrial economy.

Patents related to arsenic removal, kraft mill effluent processes, magnetics, fibre optic rotating joints and fish snackfoods are but a few examples of project areas. Resource assessments in conjunction with government have stimulated development in seaweeds, salt and cement. Through joint projects with universities we have helped to develop economic opportunities based on skills in photogrammetry, microelectronics and geophysics. Building on the province's strength in the ocean sciences, we have emphasized ocean industry development.

The Corporation's support aims especially at small manufacturing companies. Sixty percent of our clients have fewer than 25 employees and most do not have a scientist or engineer on staff. This emphasis on small business is a key in effectively using science and technology to support and stimulate economic growth in Nova Scotia.

Accomplishments, however, are history. Technological change quickly relegates accomplishments to the back burner and focuses attention on technological developments that can improve today's productivity and capitalize on tomorrow's opportunities.

In 1986/87 contacts by industry seeking technological assistance totalled over 1,000, an increase of 25% from the previous year. The widely-acclaimed Industrial Research Assistance Program (IRAP) of the National Research Council continues to be a vital component of the Corporation's technological support. NSRFC's Field Services are interfacing with the small business service-centres being established by the Department of Development at key locations cross the province.

While the demand for technological assistance maintained the growth pattern of the past several years, financial resources continue to be restrained. Soft ocean industry markets resulting from low oil prices and restraint by all levels of government offset growth in industry contracts. Overall income increased by 4% to \$6,550,000 and a small loss of \$23,000 was incurred.

Several of the Corporation's resource-oriented R&D projects received ongoing contract support. The evaluation of the potential of Cape Breton coals for liquefaction was supported by new contracts for work on two-stage thermocatalytic liquefaction. Research on mycorrhizal fungi, which form symbiotic associa-

tions with the roots of trees and agricultural crops, was supported with contracts on the potential of these fungi to increase strawberry yields and to develop drought resistance in tree seedlings.

The pace of technological change requires flexibility and rapid response. I am grateful to all members of the Corporation's staff and to the Board of Directors for their dedication and adaptability as NSRFC adopts new technology and develops new ways to deliver technology to industry.

NSRFC completed a major technology upgrade during the year with the installation of an integrated Computer-Aided Design and Manufacturing (CAD/CAM) system. The Canada-Nova Scotia Technology Transfer Agreement provided financial support.

The CAD/CAM system strengthens NSRFC's product design and prototype manufacturing capability and enables the Corporation to demonstrate CAD/CAM applications to local industry. Microcomputer-based CAD systems support NSRFC's field engineers who worked with a number of small companies helping them to apply CAD technologies in their businesses.

The Small Business Technology Centre located adjacent to NSRFC began operation at year end. This "incubator" facility provides office and manufacturing space where emerging entrepreneurs benefit from a range of common services, including the skills of NSRFC. The Centre is managed by the Nova Scotia Department of Development and is supported through the Canada/Nova Scotia Ocean Industry Subsidiary Agreement.

During the past year the Corporation has been working closely with the Nova Scotia Department of Development on science and technology policy. The national S&T policy, prepared as a common statement by Federal, Provincial and Territorial governments, represents a base on which appropriate provincial S&T programs can develop. The national S&T policy and the establishment of both a Prime Minister's National Advisory Board on Science and Technology and a Nova Scotia Council of Applied Science and Technology all point to a greater emphasis on S&T in the context of economic development.

The reality remains, however, that Nova Scotia's investment in industrially-oriented S&T remains substantially below the national average which in turn is only about one-half that of our major trading partners. We must translate policy into action quickly in order to narrow this gap and generate more economic benefits from science and technology.

NSRFC has shown over its first 40 years that investments in science and technology generate very positive economic returns. We look forward, working together with industry and government, to generating an even better return in the next 40 years. We have begun a planning project to define the best NSRFC program for the first few of these years.

T. B. Nickerson, P. Eng.,
President

The Honourable Roland
Thornhill, Minister
Department of
Development
Province of Nova Scotia
Halifax, Nova Scotia

Sir:

I have the honour of submitting the fortieth Annual Report of the Nova Scotia Research Foundation Corporation.

Respectfully yours,



T. B. Nickerson, P. Eng.,
President
Nova Scotia Research Foundation Corporation
Dartmouth, Nova Scotia
November 1, 1987

Analytical and Environmental Chemistry

Analytical and Environmental Chemistry served over 250 clients during the year, most of whom were from Nova Scotia industry. The lubricating oil quality control program was expanded and received accreditation from the Standards Council of Canada, becoming the first such analysis service accredited in Canada. Other growth areas were testing of hydrocarbon fuels, measuring asbestos in air and insulation products and quality control testing of pressure-treated wood. An extensive SO₂ monitoring program was conducted for a local industry.

The indoor air-quality monitoring service continued to grow, with the emphasis on general air quality surveys and formaldehyde testing in offices and homes. The purchase of a continuous, portable CO₂ monitor allows the rapid assessment of the overall air quality in a particular indoor environment.

Progress continued on the development of a fish-quality analyzer with support from Fisheries and Oceans Canada. The analyzer measures objectively the quality grade of a number of fish species and the results are available in a few minutes. Initial field testing has shown that the analyzer will benefit the industry, particularly in training fish graders and assisting in arbitration cases.

Biology

The Biology Section continued its long-term research program on mycorrhizal fungi which form symbiotic associations with the roots of forest trees and agricultural crops. Research funded under the Federal/Provincial Agriculture Agreement has shown that manipulation of mycorrhizal associations may help strawberry growers to produce better plants. Similarly, our work for the Canadian Forestry Service explored methods of applying mycorrhizal fungi to forest tree seedlings. This treatment is expected to improve growth and survival of seedlings after outplanting.

Microbiological services for clients in industry and government included examinations for the presence of pathogenic and non-pathogenic bacteria, yeasts and molds in water supplies, waste waters, fuels, fresh fish including shellfish, canned and frozen foods, beverages, baking products and confectionery. The laboratory has also developed special expertise in microbiological testing of domestic water filters and in sanitation surveys of processing plants and restaurants.

Coal Technology

The Coal Technology Section focused on new and better uses for coal. Process studies continued on two-stage liquefaction of Sydney area coals. The section carried out short-term tests and longer-term

demonstration runs in a thermal/catalytic processing mode using conventional hydroprocessing catalysts in the second stage reactor. High coal conversion and hydrocarbon liquid yields were achieved at relatively high catalyst consumption rates. The first stage thermal dissolver of the pilot unit was converted to a catalytic reactor and test work begun on catalytic two-stage processing. This work is funded jointly by the Federal Department of Energy, Mines and Resources and the Nova Scotia Department of Mines and Energy.

Coal Technology completed a two-year study of the air-blast atomization of coal water fuel (CWF). One CWF with 70% coal, 29% water and 1% chemical additives was tested in a number of different atomizers. Correlations were developed to allow the prediction of the mean spray droplet size from the operational parameters and the atomizer design. This study was funded by the Canada-Nova Scotia Oil Substitution and Conservation Agreement.

Contract research funded by the Canada Centre for Mineral and Energy Technology has resulted in a process for removing radium and thorium from uranium mine and mill effluents. This method is also applicable to containing radium and thorium in tailings ponds.

Geophysics

Geophysics Section activities include seismic refraction measurement of a commercial sand and gravel deposit in northern Nova Scotia, detection of fault and fracture zones in the Hilden area to solve a water contamination problem and borehole logging for the Nova Scotia Department of Mines and Energy coal and mineral programs. Deviation logs were measured in a municipal borehole for water supply purposes.

Offshore marine surveys included sediment transport on Sable Bank where we obtained excellent records of glacial tills and fluvial outwash deposits with the NSRFC Deep Tow Sparker System. The Geophysics Section completed inshore surveys for harbour dredging in New Brunswick and for a cable-crossing route in the Magdalen Islands.

Equipment development concentrated on improved sparker seismic sources. The transfer of digital seismic data from engineering seismograph to microcomputer was the subject of a joint project with students of the Technical University of Nova Scotia.

Gravity profile modelling was carried out for the Nova Scotia Department of Mines and Energy. Geophysics compiled and interpreted geophysical and other data for a proposed underwater power-cable crossing.

Atomization of coal
water fuel in spray test
chamber.



INDUSTRY SERVICES

Service to industry has always been the major thrust of the Corporation's operations. A significant step occurred in 1953 when the National Research Council contracted the Corporation to provide a Technical Information Service to small industry within the Province. Industrial engineering was added to the service in 1964. Since that time IRAP (Industrial Research Assistance Program), as it is now called, has grown to include services varying from special funding programs to technical projects. IRAP is an integral part of the Corporation's interaction with provincial industry.

The division now provides a wide range of services to provincial industry through its four sections — Field Service, Project Services, Materials and Library.

Field Service

Field Service, in cooperation with the National Research Council (NRC), delivers the Industrial Research Assistance Program (IRAP) to Nova Scotia industry. The program assists industry in solving technical problems, improving productivity and introducing materials, equipment and improved technology. There is no charge to the client for services under the IRAP program.

During the year field engineers made 1,500 plant visits, answered 2,900 queries and carried out 59 industrial engineering projects. Examples of the wide range of technical assistance provided include: determining the size of a mineral deposit, assessing the feasibility of a new processing operation, improving processing machinery, developing improved plant layouts, conducting productivity improvement studies and setting up research and develop-

ment projects.

Field Service assisted more than 100 clients in making successful application to NRC's financial contribution programs. Through these programs Nova Scotia industry received approximately \$0.5 million to help defray the cost of technical and scientific staff who complement the services provided by our field engineers.

The Nova Scotia Department of Development is currently setting up small business service centres across the Province to provide a contact point between small business and government programs. The Field Service of the Corporation is cooperating with these centres to broaden their ability to respond to client needs. Under the arrangement field engineers are assigned to each centre and will meet clients and deal with their technical problems on a scheduled basis.

With Federal-Provincial Technology Transfer Agreement funding we are introducing CAD/CAM to small businesses in the Province. Training has been undertaken on both microCAD-based systems and on the Corporation's integrated CAD/CAM system. Field engineers have helped several clients identify applications for CAD systems and some clients have purchased their own equipment. We plan to reach out to more clients and to begin to introduce computer-aided manufacturing (CAM) as well as CAD.

Project Services

Project Services provides varied specialist technical support for industry and government departments on a cost recovery basis to complement and enhance the Division's field services. Market analyses were carried out to assist local companies to assess market opportunities in areas ranging from carbonated fruit drinks and yogurt to printed circuit boards and specialty wood products. In addition to offering mathematical modelling and optimization studies to clients, Project Services provided extensive mathematical and computer systems support to other divisions of the Corporation.

Engineering design and system analysis projects were completed for several Nova Scotia fish-processing firms. Under a contract with the Inter-American Development Bank, a major study to provide a redevelopment strategy for the shrimp and lobster fisheries in Nicaragua is underway in conjunction with local consulting firms. This project will be completed in the next year.

Four client-sponsored projects were carried out for the agricultural industry through the Atlantic Farm Mechanization Institute (AFMI).

Materials

The Materials Section undertook both contract research programs and service work helping industry solve material problems and utilize new developments in materials science. The 220 and 20 KIPS tensile testing machines were used to evaluate properties of various materials in tension and bending. Fatigue studies in various environments have also been conducted.

We have continued exploring the use of alumina in structured ceramics for improving resistance to erosion. A paper on this subject was accepted by the Canadian Ceramic Society journal and presented at the 8th Symposium on the Engineering Applications of Mechanics.

The Materials Section has increased its service activity with industry during the year. We have also served lawyers and insurance firms needing analysis for claim purposes, and other consultants and testing groups who required our special capabilities. The group has provided a comprehensive range of tests on wire cables, aluminum alloy, rivets, tube sections, fabric, wire, plastics and steel.

Library

The current holdings total approximately 20,000 volumes, including reports. We enhance this information base through interlibrary loans. Online searching capabilities allow access to over 400 databases through eight systems.



Field Service Engineer reviews new plant layout with client.

PRODUCT DEVELOPMENT

In essence, the product Development Division operates as a small design, development and manufacturing company. It develops and produces a range of ocean-related products, primarily for export. The Division uses its accumulated expertise to provide design, development, CAD/CAM and prototype service to Nova Scotia industry through fee-for-service or IRAP support.

Export sales for the year were approximately \$1.1 million reflecting the slow offshore oil and gas market. Sales and contracts to Canadian Government departments dropped sharply reflecting changing Federal Government purchasing policy, but foreign military and government sales increased reflecting renewed activity in those sectors. Contracts with Nova Scotia industry increased significantly.

Engineering

CAD/CAM implementation was a major task for the Division. We now successfully operate a Prime Medusa computer-aided 3-D design system which is

New product designs included a special slip ring system for the new human centrifuge facility being installed in Toronto as part of Canada's participation in the space program and high-strength underwater electrical swivels for marine use.

Fibre-optic rotary joint development continues with our industrial partner, Focal Marine Limited of Bedford, Nova Scotia. This teaming arrangement has resulted in the sale of multipass fibre-optic rotary joints for application on cable-laying ships, tank turrets and underwater tether management systems.

Manufacturing

Manufacturing is responsible for all assembly and manufacturing operations. Sales of slip ring and rotary union products remained steady despite the economic downturn in the offshore oil and gas market. This strength is due to diversity of market with the slowdown in the oil and gas-related sales offset by increased sales to foreign military and government markets. In addition, there were significant sales of hybrid slip ring/fluid rotary unions for use on large air gun systems of seismic exploration vessels.

Sales of sub-bottom profiling systems and associated spares are at a low ebb with little activity in the geophysics hardware market.

Nova Magnetics Limited

Nova Magnetics Limited's sales have also been slow as nuclear markets in particular are quiet. Through a relationship with Autoclave Engineers of Erie, Pennsylvania, NML sold a number of high-temperature magnetic coupled pump drives.

An important sale was completed with Ontario Hydro for its Darlington Nuclear Power Plant. NML supplied a large zero-leakage regenerative blower which fully met Ontario Hydro's stringent specifications.

Quality Assurance

Quality Assurance maintains consistent high standards of quality for the ever-changing products of the Division. The guidelines of the quality program have been accepted by national agencies as well as numerous customers and companies at all levels in the marketplace. A number of Nova Scotia firms have reviewed this program as a model for their operations.

Marketing

In addition to promoting domestic and international sales, marketing is vital in identifying new opportunities and monitoring technological developments. In the past year the Corporation exhibited at trade shows in Washington, San Diego and Stavanger. We continue to expand our network of agents and now have representation in western Canada; California, the Gulf Coast, New England and the eastern United States; the United Kingdom; Norway, Denmark and Sweden; Holland; West Germany; France; Belgium; Singapore and Australia.



*J. Michael Forrestall,
MP, The Honourable
Roland J. Thornhill and
Tom Nickerson
officially open
NSRFC's CAD/CAM
facilities.*

fully integrated with our computer-aided manufacturing machine tools consisting of a CNC three-axis milling machine and a CNC lathe. Almost all engineering design drafting operations now use this system as does much of our prototype manufacturing. The skills and knowledge gained through application of these technologies in the Corporation's design/manufacturing/marketing activities will be used to assist industry throughout the Province.

An increasing portion of our engineering activities is supported by IRAP and contracts. We expect this expansion to continue as we make our CAD/CAM capability available to outside firms for development and training.

Forensic science and engineering services were introduced this year. These services include traffic accident reconstruction and chemical and metallurgical analysis for the legal community, police and insurance companies.

FILIALES

National Research Council (NRC)

The Industrial Research Assistance Program (IRAP) is made available to industry across Canada through a network of field offices. These field offices are established by NRC, the various provincial research organizations, members of the Association of Consulting Engineers of Canada and other technology centres across the country. In Nova Scotia eight of the eleven IRAP Industrial Technology Advisors are Nova Scotia Research Foundation Corporation staff.

Major funding for this activity is provided by NRC, which covers all of the direct people costs involved in providing the service and a portion of the related overhead costs. Nova Scotia Research provides facilities and a major portion of overhead costs related to the service. All of the R&D and problem-solving funding is provided to NRC through the IRAP program. The annual budget for IRAP contributions to firms involved in research and development in Nova Scotia exceeds \$1 million.

Over the past few years the IRAP network has grown considerably. The service began as a basic technical information service for small manufacturers and now involves manufacturing, the technical and technological service industry and the construction industry as well. In addition, the service now provides technical and engineering advice, technology transfer and innovation, research and development program organization and financial support for these kinds of activities.

Each year numerous cost benefits are identified which clearly demonstrate the positive economic impact that the service has on our provincial economy. IRAP has a record of strong industry recognition and support.

Applied Microelectronics Institute (AMI)

The Applied Microelectronics Institute, founded in 1981, continues under joint sponsorship of the Nova Scotia Foundation Corporation, the Technical University of Nova Scotia and Dalhousie University.

In 1986/87 contract services accounted for 70% of AMI's revenue. To maintain its leadership in the application of advanced electronic engineering design techniques, AMI has developed a comprehensive five-year business plan which expands activities to include the application of integrated circuit design and production processes related to surface mount technology.

Increased marketing staff will promote AMI's capabilities and expertise to potential clients as we build on the past year's record base of over forty clients' widely varied projects. They ranged from consumer electronic products to sophisticated systems integrating hardware development with real time software design.

The activities of the Nova Scotia Research Foundation Corporation and AMI have become more closely integrated, with AMI acting as the prime resource for sophisticated electronic design requirements. This collaborative effort is expected to

grow over the coming year as the requirements for sophisticated electronics by NSRFC increase and the capabilities of AMI are more fully utilized.

Atlantic Farm Mechanization Institute (AFMI)

The Atlantic Farm Mechanization Institute, a non-profit corporation, was created in 1985 to carry out research, development and testing of agricultural and woodlot machinery with the objective of tailoring it for use under Atlantic Canada conditions.

The Institute is administered by a Board of Directors made up of farmers, extension agricultural engineers and representatives of the farm machinery industry. Created in the form of an "institute without walls", AFMI carries out its activities by drawing together expertise and resources within various institutions and firms in the region.

AFMI operations are managed by the Nova Scotia Research Foundation Corporation, under the direction of the Institute's Board of Directors. The Institute carries out specific projects on a contract basis for individual clients and agencies.

Recently completed projects include the design of equipment for processing fresh blueberries and vegetable salads, and evaluations of disc mower conditioners and blueberry packing lines.

Atlantic Institute of Biotechnology (AIB)

The Atlantic Institute of Biotechnology was conceived to help Atlantic Canada industries take advantage of biotechnology and other advanced bioscience. It was incorporated in 1985 as a private non-profit research institute sponsored by Dalhousie University, the Nova Scotia Research Foundation Corporation, Technical University of Nova Scotia and the Nova Scotia Agricultural College. DRIE provided a seed grant of \$2.48 million.

AIB activities are commercially oriented. Full-time staff have industrial experience, and the team includes expertise in business analysis, marketing and R&D management. Assistance can be financial as well as scientific and technological.

R&D projects focus on specific industrial objectives and are normally directed and controlled by personnel from the client company. Projects may be carried out within the company or, where required, access can be arranged to facilities and expertise at the Institute's laboratory or elsewhere in the region. The Institute is establishing a comprehensive inventory of research capabilities that can be made available for industrial tasks in the Atlantic region.

During the past year AIB has been involved in research projects ranging from cloning nursery plants, to converting potato waste to alcohol and designing computer-controlled chicken coops.



NSRFC Field Service Engineer discusses a new product being developed with assistance from the IRAP Program.

AUDITOR'S REPORT

To the Chairman and Members of the
Board of Directors of the
Nova Scotia Research Foundation Corporation

I have examined the consolidated balance sheet of the Nova Scotia Research Foundation Corporation as at March 31, 1987 and the consolidated statements of revenues and expenses and retained earnings for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these consolidated financial statements present fairly the financial position of the Corporation as at March 31, 1987 and the results of its operations for the year then ended in accordance with the accounting policies stated in Note 2 to the financial statements, applied on a basis consistent with that of the preceding year.

O.P. Cormier, F.C.A.
Auditor General

Halifax, Nova Scotia
June 10, 1987

Consolidated Balance Sheet as at March 31, 1987

Assets	1987	1986
Current		
Cash	\$ 487,972	\$ 632,959
Accounts receivable	1,335,407	1,461,506
Inventory	358,723	392,751
	<u>2,182,102</u>	<u>2,487,216</u>
Research Endowment Fund		
Province of Nova Scotia 8.75% promissory note, maturing November 20, 1987	<u>1,000,000</u>	<u>1,000,000</u>
Fixed		
Land and Buildings	2,843,267	2,843,267
Equipment	1,632,784	1,604,157
	<u>4,476,051</u>	<u>4,447,424</u>
	<u>\$7,658,153</u>	<u>\$7,934,640</u>
Liabilities and Equity	1987	1986
Current		
Accounts payable		
Trade	\$ 315,414	\$ 368,383
Province of Nova Scotia	1,168,850	1,531,130
Deferred revenue	222,018	89,186
	<u>1,706,282</u>	<u>1,988,699</u>
Research Endowment Fund		
Fund balance	<u>1,000,000</u>	<u>1,000,000</u>
Equity		
Contributed surplus	4,476,051	4,447,424
Retained earnings	475,820	498,517
	<u>4,951,871</u>	<u>4,945,941</u>
	<u>\$7,658,153</u>	<u>\$7,934,640</u>

Loan Guarantees (Note 3)

**Consolidated
Statement of
Retained Earnings**
*for the year ended
March 31, 1987*

	1987	1986
Balance, beginning of year	\$498,517	\$709,213
Less: Net loss	22,697	210,696
Balance, end of year	<u>\$475,820</u>	<u>\$498,517</u>

**Consolidated
Statement
of Revenues
and Expenses**
*for the year ended
March 31, 1987*

	1987	1986
Revenues		
Scientific and engineering (Note 4)	\$4,213,852	\$4,054,797
Grant from Province of Nova Scotia	2,336,000	2,233,100
	<u>6,549,852</u>	<u>6,287,897</u>
Expenses		
Scientific and engineering	5,600,539	5,590,367
Administrative and occupancy	1,162,659	1,123,224
	<u>6,763,198</u>	<u>6,713,591</u>
Operating loss before investment income	<u>213,346</u>	<u>425,694</u>
Investment Income		
Research Endowment Fund	89,349	104,555
Short term investments	101,300	110,443
	<u>190,649</u>	<u>214,998</u>
Net loss	<u>\$ 22,697</u>	<u>\$ 210,696</u>

**Notes to the
Consolidated
Financial
Statements**
March 31, 1987

1. Authority

The Nova Scotia Research Foundation Corporation was established in 1975 by the Act to Establish the Nova Scotia Research Foundation Corporation. Its purpose is to assist in the economic development of Nova Scotia by promoting, stimulating and encouraging the effective utilization of science and technology by industry and government.

2. Accounting Policies

a) Principles of Consolidation

The consolidated financial statements include the accounts of Nova Magnetics Limited which is 100% owned by the Nova Scotia Research Foundation Corporation.

b) Inventory

Inventory is valued at the lower of cost and net realizable value.

c) Fixed assets and contributed surplus

Fixed assets are acquired by purchase or donation.

When fixed assets are acquired out of the general revenues of the Corporation, they are charged to expense in the year of acquisition.

The costs of all capital additions, whether by purchase or donation, are recorded as fixed assets with an offsetting credit to contributed surplus.

When fixed assets are constructed by the Corporation, the related material, labor and overhead costs are included as fixed assets in the year of expenditure.

When equipment is ten years old, the cost is removed from both the fixed asset and contributed surplus accounts.

d) Government assistance

Funds received through the Federal/Provincial Technology Transfer Subsidiary Agreement applied to the acquisition of equipment are offset against the cost of this equipment. Funds received for operating expenses incurred in accordance with the Agreement are recorded as revenue in the same year as the expenses were incurred.

3. Loan Guarantees

The Corporation has provided a total guarantee of \$140,000 to the Royal Bank of Canada as security for a loan and line of credit from the bank to the Applied Microelectronics Institute.

On March 31, 1987, the balance outstanding on the loan was \$42,369.

4. Government Assistance

Scientific and engineering revenues include government assistance of \$63,901 for expenses incurred under the Federal/Provincial Technology Transfer Subsidiary Agreement.

PERS, PLICATIONS ATENTS

Betancourt, T.; Robichaux, M.; Matthews, J.
"Statistical Behaviour of Fatigue and Crack Growth in Weldments of HY-80 Steel Plate and its Weldments under Cathodic Protection," presented at the 2nd Annual CFCRAD Meeting, DREA, Halifax, Nova Scotia, May 1987.

Kazi, H.A.
"Advanced Ceramics Activity at the Nova Scotia Research Foundation Corporation," presented at a workshop of the Canadian University Industry Council on Advanced Ceramics, February 1987.

Kazi, H.A.
"Alumina as a Technical Ceramic," proceedings of 8th Symposium on Engineering Applications of Mechanics, University of Sherbrooke, Quebec, 1986.

Kazi, H.A.; Whiteway, S.G.; Chen, E.
"Erosion and Thermal Shock Tests on Ceramic Materials," *The Canadian Journal of Chemical Engineering*, Vol. 64, No. 2, 1986.

Kazi, H.A.; Whiteway, S.G.; Chen, E.; Murphy, D.D.
"Resistance to Abrasion and Thermal Shock in Transformation Toughened Alumina," *Journal of the Canadian Ceramic Society*, Vol. 55, 1986.

Lutwick, G.D.
Patent Application 771,606, Method and Apparatus For Mixing Two or More Components Such As Immiscible Liquids.

MacAulay, D.; Sibley, K.
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Stover, H.S.H.; Thambimurthy, K.V.
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"Correlation of CSF Spray Droplet Size with Atomizer and CSF Data: Equipment Description and Preliminary Results," 8th International Workshop on Coal-Liquid and Alternate Fuels Technology, Halifax, Nova Scotia, September 1986.

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APENS representative on the Technical University of Nova Scotia Senate

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Mentor for the Engineers in Training at the Association of Professional Engineers of Nova Scotia (APENS)

Edmonds, T.
Member of the Local Chapter of the Canadian Construction Research Board

Hellenbrand, K.
Member of the Board of the Atlantic Institute of Biotechnology

Helliwell, J.
Member of the Economic Development Committee of the Halifax Board of Trade

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Jay, D.
Secretary for the Nova Scotia Chapter of 'WISE' - Women in Science and Engineering

MacAulay, D.
Chairman of the Board of Examiners, Association of Professional Engineers of Nova Scotia
Chairman and Council Member of the Nova Scotia Institute of Agrolgists

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Member of the New Grants Committee for United Way

Member of the Professional Development Committee of the Institute of Chartered Accountants of Nova Scotia (ICANS)

1986 Board Member of the Metro Services for the Deaf

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Council Member of the Dartmouth Chamber of Commerce. Chairman of the Public Relations Committee and Editor of the Chamber's publication "Dartmouth Business News"

Member of the Board of Directors of the Halifax/Dartmouth United Way

Marshall, J.
Member of the Offshore Trade Association of Nova Scotia (OTANS) Program Committee

McKay, A.
Member of the Technical University of Nova Scotia Seminar Committee, Continuing Education Department for Engineering and Construction of Marine Structures

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Chairman of the Applied Microelectronics Institute

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Selection Committee Member of the Ernest C. Manning Awards Foundation

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Past President of the Association of Professional Engineers of Nova Scotia

Member of the Board of Directors of the Discovery Centre

Roberts, R.
Member of the Dartmouth Chamber of Commerce's Trade Industries and Offshore Advisory Group Committee

Robertson, W.
Member of the Dartmouth Lakes Advisory Committee

Spencer, W.
Developing a computer aided dispatch system for the Waverley Fire Department as a community service project

Starzowski, J.
Nova Scotia Representative on Canada-Japan Coal Liquefaction Working Group

Stover, N.
Member of the Coal Liquid Mixture Working Group, Executive Committee

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OCEANS '87 Conference Committee Members

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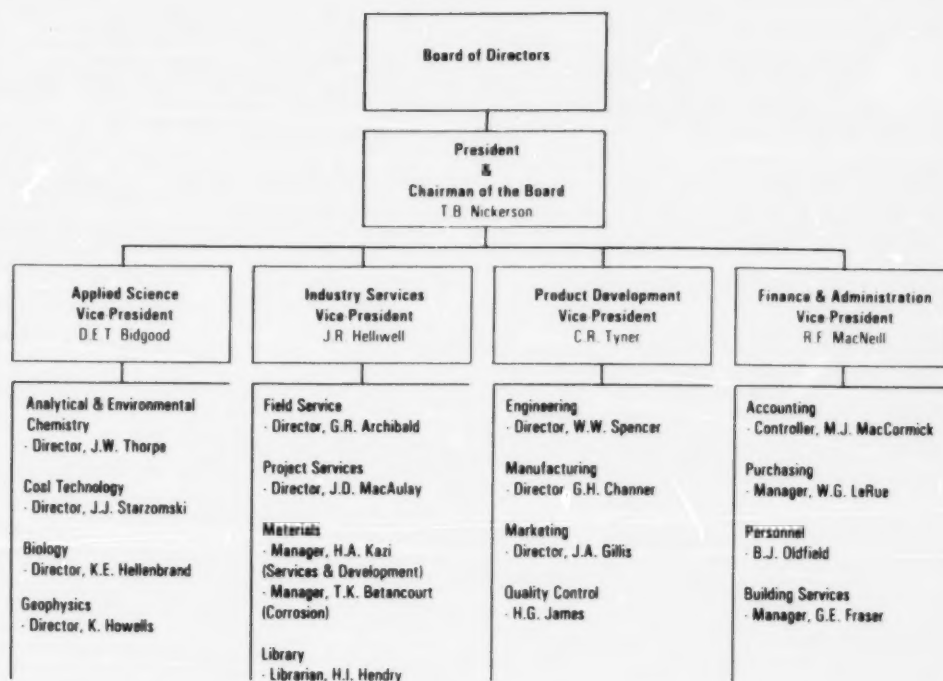
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Various NSRFC staff are active members of the following:

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